The role of Hedgehog-responsive fibroblasts in facial nerve regeneration.

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Authors: Gabriela L Bobarnac Dogaru, Subhash C Juneja, Alireza Shokrani, Roseanne Y Hui, Yang Chai, Jon-Paul Pepper

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Public Summary:
BACKGROUND: Facial nerve paralysis is a significant cause of morbidity, affecting facial appearance, emotional expression, speech, oral competence, and vision. A more complete understanding of the complex cellular events required for successful nerve regeneration may reveal new therapeutic targets. The role of fibroblasts in regeneration, and the process by which the nerve reforms its three-dimensional structure after a transection injury, are not fully understood. The Hedgehog signaling pathway has been shown to mediate nerve sheath formation during development. We therefore sought to characterize the role of Hedgehog-responsive cells following transection of the facial nerve. METHODS: Two transgenic mouse lines with reporters for the downstream effector of Hedgehog signaling, Gli1, were used. The animals underwent a unilateral facial nerve transection injury, and the contralateral side served as a control. Facial nerves were analyzed via immunohistochemistry and immunofluorescence at predetermined time points as the facial nerve regenerated after the transection injury. RESULTS: There was a statistically significant increase in Gli1+ cells both at the site of injury and within the distal nerve segment over time. Gli1+ cells are fibroblasts within the nerve and appear to contribute to the reformation of the nerve sheath after injury. CONCLUSION: These findings describe a key signaling pathway by which fibroblasts participate in motor nerve regeneration. Fibroblasts that reside within the nerve respond to injury and may represent a novel therapeutic target in the context of facial nerve regeneration after transection injury.

Scientific Abstract:
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